Introductory Experimental Ecology and Evolutionary Biology

Instructor: Scott E. Solomon, Ph.D.
Office: Anderson Biology Lab 130D
Instructor Office Hours: Wed 9:00 am – noon
Phone: (713) 348-2661
Email: scott.solomon@rice.edu
Website: http://solomon.rice.edu

TA Office Hours: Sunday 1 – 5 PM in ABL 124

Course Website: https://canvas.rice.edu/courses/14693

Course Description:
This is a two credit, half-semester* course that introduces students to the science of ecology and evolutionary biology through hands-on, inquiry-based laboratory and field exercises. The class meets twice a week: a lecture on Mondays introduces the week's topic; students then attend one afternoon lab that provide practical experience in the fundamentals of natural history, data collection and analysis, and communication of results.

Note that EBIO 213 begins on October 15.

Course Learning goals:
By the end of the course, you will be expected to know and be able to do the following things:

- **Generate a valid scientific hypothesis** and suggest several feasible ways to test it;
- **Perform basic statistical analyses**, including t-tests and Chi-squared tests;
- **Search for and locate peer-reviewed research articles** and extract meaningful information;
- **Create a scientific report** using appropriate format, terminology, grammar, citations, and figures;
- **Demonstrate competence in basic skills** in ecology and evolutionary biology:
    - Formulate a valid hypothesis and design simple experiments to test it;
    - Survey a population and determine whether its sex ratio deviates from 1:1;
    - Conduct a biological species inventory, quantify the diversity of the samples collected, and assess the results;
    - Distinguish between ecosystems, habitats, and microhabitats and provide examples of each;
    - Identify abiotic and biotic factors that determine a species' geographic range and explain how these contribute to an organisms' fundamental and realized niche;
    - Explain the role of taxonomy in systematics and its importance to the biological sciences;
    - Approximate the number of living species on the planet and their relative distribution across the tree of life;
    - Reconstruct and interpret a phylogenetic tree;
    - Use online databases to search for, interpret, and analyze DNA sequence data.

Location and Time:
Lectures are Mondays from 3-3:50 PM in **BRK 101**. Labs are on Tuesdays or Wednesdays 1–4:50 PM in **ABL 124**. Due to space constraints, ***students must attend the lab section for which they are officially enrolled***.

Course Schedule:

Week	Date	Topic
Week 1	Oct 15	Lecture: Intro to conducting research in ecology and evolution
	Oct 16, 17	Lab 1: Squirrel behavior (around campus)
Week 2	Oct 22	Lecture: Population biology and basic statistics
	Oct 23, 24	Lab 2: Isopod population biology (around campus)
Week 3	Oct 29	Lecture: Introduction to local ecosystems
	Oct 30, 31	Lab 3: Local ecosystems (Field trip—return by 6:30 pm)
Week 4	Nov 5	Lecture: Measuring biological diversity
	Nov 6, 7	Lab 4: Biodiversity of leaflitter organisms (in lab)
Week 5	Nov 12	Lecture: Taxonomy and systematics
	Nov 13, 14	Lab 5: Reconstructing evolutionary history (in lab)
	Nov 19	*No class*
	Nov 20, 21	*No class*
Week 6	Nov 26	Lecture: Molecular evolutionary genetics
	Nov 27, 28	Lab 6: The Tree of Life and molecular sequence data (in lab)

Requirements:
Students are required to attend all labs. Students must attend the lab section for which they are registered (unless they are ill, in which case they must contact Dr. Solomon ***before*** their scheduled class). Course announcements will be posted on the course website and sent to each students' Rice email addresses, so students are responsible for regularly checking both the course website and their email accounts.

Field Trip:
The third lab will take place off campus. Transportation will be provided and will leave from campus. Because of the travel time (about an hour each way) we return to campus by 7 pm. ***Students must be prepared to get dirty and wet***; recommended clothing includes long pants, boots or old tennis shoes, a hat, sunscreen, insect repellant, a raincoat or poncho. Students should bring water and a snack. More details will be provided in the pre-lab lecture.

Lab reports:
For each lab, students will complete an exercise during the scheduled class time (note that these hours will be extended for the field trip during lab 3). ***Lab reports will be submitted electronically and are generally due by Monday at noon the week following each lab.*** Reports submitted after the deadline will be penalized 5 points per 24 hours late.

Honor Code:
Quizzes are open notes, closed-book and closed-internet. Students are expected to work in groups during in-class laboratory exercises, but all laboratory reports should be completed individually. Any sources used to complete a lab report, including materials provided as part of the class (i.e. lectures and readings posted on the course website), must be properly cited.

Note:
If you have a disability that will impact your coursework, please speak with Dr. Solomon during the first two weeks of class. All discussions remain confidential. Additionally, you must contact Disability Support Services (http://dss.rice.edu/) located in the Allen Center, Room 111.

Grading:
Grades for this course are based on quizzes taken on the course website following each lecture and lab write-ups due at the start of lab the following week. Points are assigned as follows:

Assignment	Points / Assignment	Number	Subtotal	% of final grade
Lab reports 1, 5, 6	30	3	90	30%
Lab reports 2, 3, 4	50	3	150	50%
Quizzes	10	6	60	20%
Total			300	100%

The minimum point thresholds for each course letter grade are given below:

Letter Grade:	D–	D	D+	C–	C	C+	B–	B	B+	A–	A	A+
Minimum Points Needed:	180	189	204	210	219	234	240	249	264	270	279	294

Required readings listed by week:
All readings are available as pdfs on the course website

Week 1
Lee, Jeffrey A. (2000) *The Scientific Endeavor: A Primer on Scientific Principles and Practice* Addison Wesley Longman, Inc.
Chapter 3 "Research" pp. 27 – 55

Pianka, Eric R. (2000) *Evolutionary Ecology*, 6th ed. Addison Wesley Longman, Inc.
Chapter 1 "Background" pp. 1 – 15

Rudgers, Jennifer *Guidelines for Writing Scientific Papers* unpublished.

Week 2
Kingsolver, Robert (2006) *Ecology on Campus* Benjamin Cummings.
Chapter 1 "Describing a Population" pp. 1 – 10

Motulsky, Harvey (2010) *Intuitive Biostatistics: A Nonmathematical Guide to Statistical Thinking* Oxford University Press.
Chapter 1 " Statistics and Probability Are Not Intuitive" pp. 3 - 13
Chapter 2 "Why Statistics Can Be Hard to Learn" pp. 14 – 16
Chapter 3 "From Sample to Population" pp. 17 – 22
Chapter 15 "Introducing P Values" pp. 111 – 121

Week 3
Kingsolver, Robert (2006) *Ecology on Campus* Benjamin Cummings.
Chapter 8 "The Niche" pp. 177 – 198
Chapter 15 "Soils" pp. 337 - 360

Week 4
Kingsolver, Robert (2006) *Ecology on Campus* Benjamin Cummings.

Chapter 13 “Biodiversity” pp. 299 – 318

Johnson, Elizabeth A. and Catley, Kefyn M. (2002) *Life in the Leaflitter* The American Museum of Natural History, 17 pp.

Week 5

Wilson, Edward O. (1999) *The Diversity of Life* W. W. Norton & Co.
Chapter 4 “The Fundamental Unit” pp. 35 – 50

Baum, David (2008) Reading a phylogenetic tree: The meaning of monophyletic groups. *Nature Education* 1(1).

Week 6

Agostino, M. (2012). *Practical bioinformatics*. Garland Science.
Chapter 1 “Introduction to Bioinformatics and Sequence Analysis”